

(19) World Intellectual Property Organization
International Bureau(43) International Publication Date
18 January 2001 (18.01.2001)

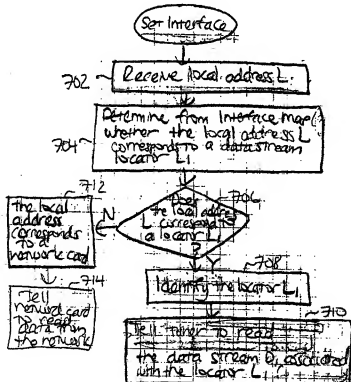
PCT

(10) International Publication Number
WO 01/05158 A1

- (51) International Patent Classification: H04N 7/24
- (21) International Application Number: PCT/US00/19394
- (22) International Filing Date: 13 July 2000 (13.07.2000)
- (25) Filing Language: English
- (26) Publication Language: English
- (30) Priority Data:
60/143,428 13 July 1999 (13.07.1999) US
60/194,569 4 April 2000 (04.04.2000) US
- (71) Applicant: SUN MICROSYSTEMS, INC. [US/US]; 901 San Antonio Road, Palo Alto, CA 94303 (US).
- (72) Inventors: COURTNEY, Jonathan, D.; 1623 Koch Lane, San Jose, CA 95125 (US); RIVAS, Jesus, David; 258 28th Street, San Francisco, CA 94131 (US); YE, Tao; 929 E. El Camino Real, #116, Sunnyvale, CA 94087 (US).
- (74) Agent: HEILBRUNN, Elise, R.; Beyer Weaver & Thomas, LLP, P.O. Box 130, Mountain View, CA 94042-0130 (US).
- (81) Designated States (national): AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, BZ, CA, CH, CN, CR, CU, CZ, DE, DK, DM, DZ, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TR, TT, TZ, UA, UG, UZ, VN, YU, ZA, ZW.
- (84) Designated States (regional): ARIPO patent (GH, GM, KE, LS, MW, MZ, SD, SL, SZ, TZ, UG, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GW, ML, MR, NE, SN, TD, TG).
- Published:**
— With international search report.

[Continued on next page]

(54) Title: METHODS AND APPARATUS FOR SELECTING MULTICAST IP DATA TRANSMITTED IN BROADCAST STREAMS



(57) Abstract: Through the association of an unique IP address with each data stream, a single system may be used by a network card or a tuner to select multicast IP data. More particularly, a locator adapted for identifying a data stream is obtained. The locator is then mapped to an IP address. Through the use of this mapping, a digital television receiver may obtain the appropriate locator to read the associated data stream. It is then determined whether the IP address corresponds to a data stream locator associated with a data stream. If this is the case, a tuner is instructed to read the data stream associated with the data stream locator. However, if the IP address does not correspond to a data stream locator, a network card identified by the IP address is instructed to read data from the associated network. Since each data stream may be associated with a plurality of multicast IP addresses, a multicast group address is specified to identify the appropriate multicast IP data transmitted in the data stream. Packets addressed to the multicast group address may then be received by either a tuner or a network interface card.

WO 01/05158 A1



— Before the expiration of the time limit for amending the claims and to be republished in the event of receipt of amendments.

For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

5 METHODS AND APPARATUS FOR SELECTING
 MULTICAST IP DATA TRANSMITTED IN
 BROADCAST STREAMS

10

BACKGROUND OF THE INVENTION

1. FIELD OF THE INVENTION

 The present invention relates generally to computer software. More
 particularly, the present invention relates to methods and apparatus for selecting
15 multicast data transmitted in broadcast streams.

2. DESCRIPTION OF RELATED ART

 The digital television revolution is one of the most significant events in the
 history of broadcast television. With the advent of digital television, high speed data
20 transfer is possible via satellite, cable and terrestrial television channels. Digital
 television offers users more channels as well as significantly improved video and
 audio quality. Most importantly, digital television ushers in the age of true interactive
 television. For instance, digital receivers will be able to offer users a variety of
 enhanced services, from simple interactive quiz shows, to internet, and a mix of
25 television and web-type content. As the market for digital television grows, content
 developers are looking for a feature-rich, cost-effective, and reliable software
 platform upon which to build the next generation of interactive television services

such as Electronic Programming Guides, Video-On-Demand, and Enhanced Broadcasting.

Java is a leading commercial object-oriented language designed as a portable language that can run on any compatible device that supports the JAVA™

5 PLATFORM. For instance, Java is incorporated into all major Web browsers. Thus, Java runs on any web-enabled computer via that computer's Web browser. As such, Java offers great promise as the software platform for set-top boxes and digital television.

In object-oriented programming, code and data are merged into objects. Each
10 object is defined via its class, which determines the properties and behavior of an object. In other words, objects are individual instances of a class.

In an interactive digital television environment, it will be common to receive data from multiple sources. For instance, a television program (i.e., service) received by a particular channel might consist of audio, video as well as other data (e.g. IP data
15 streams). With the advent of digital television, it would be desirable if the data received by a television receiver could include data from the Internet and therefore conform to the Internet Protocol (IP). Moreover, it would be desirable if each channel could receive data from multiple sources.

When a television channel broadcasts digital data to viewers, it is impossible
20 to address digital data to each viewer individually (e.g., through a single address). Thus, in order to send digital data to multiple television viewers simultaneously, multicast addressing must be used. However, no central repository or mechanism exists to verify that the same multicast address is not used by multiple sources (e.g., channels). It is therefore impossible to distinguish data streams by the associated
25 multicast address. Moreover, it would be desirable to transmit data received from

other sources such as those available on the Internet on two different channels. It is therefore possible that the data received by these multiple sources may conflict. This is particularly important since picture-in-picture capability is available in most televisions. As a result, it is possible that conflicting data may be received by

5 multiple channels that are being simultaneously displayed via a picture-in-picture option. Thus, conflicting data may be provided to a single channel through multiple data streams or to multiple channels through a single data stream received by each of the channels. In either case, when this data is ultimately provided to one or more television channels, it would be undesirable if this conflicting data were broadcast to

10 television viewers via the wrong television channel or presented in an incorrect manner by a television channel.

In view of the above, it would be beneficial if a mechanism for unambiguously identifying and selecting one of the data streams associated with a particular channel could be provided. Moreover, it would be desirable if such a mechanism were

15 designed to identify, select, and read a multicast IP data stream transmitted in a broadcast stream, even where multiple data streams are associated with the same multicast address.

SUMMARY

The present invention enables multicast IP data transmitted in broadcast

20 streams to be selected and received. More particularly, a network interface card has an associated IP address. However, a digital television receiver cannot identify a network interface card. Rather, a digital television receiver communicates solely with one or more associated tuners. Thus, through the association of an IP address with

each data stream, a single system may be used to read and display data associated with a network card as well as a tuner.

In accordance with one aspect of the invention, each data stream associated with a tuner is identified by a unique IP address. More particularly, a locator adapted for identifying a data stream is obtained, where the locator is associated with one of a plurality of data streams. The locator is then mapped to an IP address. Through the use of this mapping, a digital television receiver may obtain the appropriate locator to read the associated data stream. In this manner each data stream may be uniquely identified, even where multiple data streams are associated with a single multicast address.

In accordance with another aspect of the invention, it is determined whether the IP address corresponds to a data stream locator associated with a data stream. When it is determined that the IP address corresponds to a data stream locator, a tuner is instructed to read the data stream associated with the data stream locator. However, when it is determined that the IP address does not correspond to a data stream locator, a network card identified by the IP address is instructed to read data from its associated network. However, all information in a particular data stream may not be relevant. More particularly, it may be desirable to filter the information in the data stream. Thus, since each data stream may be associated with a plurality of multicast IP addresses, a multicast group address may then be specified to identify the appropriate multicast IP data transmitted in the broadcast stream. Packets addressed to the multicast group address may then be received by either a tuner or a network interface card. Accordingly, a single system may be used to select and receive multicast IP data transmitted in broadcast streams via a network card or a tuner.

BRIEF DESCRIPTION OF THE DRAWINGS

The invention, together with further advantages thereof, may best be understood by reference to the following description taken in conjunction with the accompanying drawings in which:

5 FIG. 1 is a block diagram illustrating a digital television receiver in which the present invention may be implemented.

FIG. 2 is a block diagram illustrating a system in which the present invention may be implemented.

FIG. 3 is a process flow diagram illustrating a method of receiving packets
10 addressed to a multicast address in accordance with an embodiment of the invention.

FIG. 4 is a diagram illustrating the use of locators to identify data streams in accordance with an embodiment of the invention.

FIG. 5 is a diagram illustrating the use of an interface map to map a data stream to an IP address through the use of a locator in accordance with an
15 embodiment of the invention.

FIG. 6 is a process flow diagram illustrating a method of identifying a data stream using an interface map such as that illustrated in FIG. 5.

FIG. 7 is a process flow diagram illustrating a method of performing the set interface method shown at block 306 of FIG. 3 in accordance with an embodiment of
20 the invention.

FIG. 8 is a block diagram illustrating a typical, general-purpose computer system suitable for implementing the present invention.

DETAILED DESCRIPTION OF THE PREFERRED

EMBODIMENTS

In the following description, numerous specific details are set forth in order to
5 provide a thorough understanding of the present invention. It will be apparent,
however, to one skilled in the art, that the present invention may be practiced without
some or all of these specific details. In other instances, well known process steps
have not been described in detail in order not to unnecessarily obscure the present
invention.

10 The invention is described within the context of a digital television and digital
television receiver. FIG. 1 is a block diagram illustrating an exemplary digital
television receiver. As shown, a signal is received via antenna 102 and tuned by tuner
module 104, producing MPEG2 transport stream 106. De-multiplexer 108 then
produces encrypted MPEG streams 110 including a video stream 112, an audio stream
15 114, and one or more data streams 116. These three streams are then processed by
conditional access subsystem 118. For instance, the conditional access subsystem 118
may utilize key management information 120 as well as decryption information 122
(e.g., decryption algorithms). The conditional access subsystem 118 produces
decrypted MPEG streams 123 including a video stream 124 and audio stream 125 as
20 well as data 126, all of which are decrypted. A decoder 128 then processes the
decrypted MPEG stream 123, and forwards the decoded video data to frame buffer
130 and transmits the decoded audio data to speaker 132.

A Java Virtual Machine is one platform that may be used to implement the
present invention to process information received by a digital television receiver such

as that illustrated in FIG. 1. More particularly, when the data 126 (e.g., broadcast data stream) is processed, it may be desirable to process information such as a downloaded application provided in the data 126. Moreover, each associated service or program provided by a channel may include one or more data streams, as represented by the data 126 as described above with reference to FIG. 1.

FIG. 2 is a block diagram illustrating an exemplary system in which the present invention may be implemented. A digital television receiver 202 is shown to include a first television tuner 204 and a second television tuner 205. A receiver typically requires a tuner for each different picture (e.g., picture-in-picture) provided.

Thus, when a receiver includes two or more tuners, multiple channels may be simultaneously be available to a television viewer. As shown, the first tuner 204 has an associated video stream 206, audio stream 208 and data stream 210. Similarly, the second tuner 205 has an associated video stream 212, audio stream 214, and a first data stream 216, a second data stream 218 and a third data stream 220. Thus, the second tuner 205 has three associated data streams. It would be desirable if the data streams received by the television receiver could include Internet Protocol (IP) formatted data. However, as described above, since multiple sources of data may be using the same multicast group address, it is necessary to distinguish the data streams from one another.

FIG. 3 is a process flow diagram illustrating a method of receiving packets addressed to a multicast address in accordance with an embodiment of the invention. In accordance with one embodiment, a method of selecting multicast IP data transmitted in broadcast streams is implemented through the customization and modification of a method of receiving packets by a network card. First, a Java.net.multicastsocket class is obtained at block 302. Next, a multicast socket

object capable of listening for multicast data which is sent through the object is instantiated at block 304. More particularly, the object includes a method for specifying an IP address, a method for specifying a multicast group address to listen in on, and a method for receiving packets addressed to the multicast address. These methods are then called in blocks 306 through 310. At block 306, the method for specifying an IP address is called. More particularly, the method instructing a tuner to read a data stream associated with the IP address when the IP address corresponds to a data stream locator, and otherwise instructs a network card to read data from the network. One method of specifying an IP address is described in further detail below with reference to FIG. 7. Next, at block 308, the method for specifying a multicast group address is called to specify a multicast group address associated with the IP address (e.g., data stream). The method for receiving packets addressed to the multicast group address is then called at block 310. Garbage collection may then be performed for the multicast object when it is no longer being used.

Through the modification of the method of specifying an IP address (i.e., via a set interface method) described above at block 306, multicast IP data may be received by a tuner as well as a network card. When the set interface method is called, an IP address is provided to the set interface method. More particularly, the IP address corresponds either to a network interface card or the IP address corresponds to a data stream. When the IP address is associated with a data stream rather than a network interface card, the appropriate IP address must be obtained. Thus, even when multiple sources are transmitting on the same multicast group address, the present invention enables each data stream to be uniquely identified. FIGs. 4 through 6 illustrate a mechanism for mapping an IP address to a data stream in order to uniquely

identify that data stream, even where multiple data streams are associated with the same multicast group address.

FIG. 4 is a diagram illustrating the use of locators to identify data streams in accordance with an embodiment of the invention. As described above, multiple data streams 216, 218, and 220 may be associated with a single multicast IP address. In order to distinguish the data streams 216, 218 and 220 from one another, a locator adapted for identifying a data stream is associated with each of the data streams 216, 218 and 220. Each of the data streams 216, 218 and 220 may be associated with the same channel or a different channel.

In accordance with one embodiment of the invention, an interface map is used to create a one-to-one mapping between each data stream and an associated local IP address. Thus, even where data streams are associated with the same multicast IP address, the data streams may be uniquely identified through the associated local IP addresses. FIG. 5 is a diagram illustrating the use of an interface map to map a data stream to an IP address through the use of a locator in accordance with an embodiment of the invention. As shown, for a particular data stream D1 500, a locator L1 502 is obtained. For instance, the locator 502 may be a locator object that has been obtained from an outside source. Alternatively, the locator 502 may be instantiated internally by an interface map 504. Once the interface map 504 has obtained the locator 502, a local IP address L 506 is generated and mapped to the locator L1 502. For instance, the local IP address L 506 may be obtained from a pool of available IP addresses. Thus, through the use of the interface map 504, a one-to-one correspondence is created between each data stream and a local IP address.

FIG. 6 is a process flow diagram illustrating a method of identifying a data stream using an interface map such as that illustrated in FIG. 5. As shown, a locator

is obtained at block 602. For instance, a locator object may be instantiated or obtained from another source. The locator is then associated with one of a plurality of data streams at block 604, each one of the plurality of data streams being associated with one of a plurality of television channels. For instance, the data streams may be associated with the same channel or different channels. An interface map such as that illustrated in FIG. 5 is then used to map the locator to an IP address at block 606. For instance, the IP address may be generated from a set of local IP addresses reserved for use in private networks. The locator object may then be garbage collected when it is no longer used. In this manner, data streams associated with one or more tuners may be identified.

Once the IP address associated with the data stream locator is obtained from the interface map, the address may be used to specify the local IP address via the set interface method as shown at block 306 of FIG. 3. FIG. 7 is a process flow diagram illustrating a method of performing the set interface method shown at block 306 of FIG. 3 in accordance with an embodiment of the invention. Once a local IP address is obtained at block 702, it is determined from the interface map whether the local IP address corresponds to a data stream locator associated with a data stream at block 704. At block 706, when it is determined that the IP address corresponds to a data stream locator associated with a data stream, the data stream associated with the data stream locator is selected. More particularly, the digital television receiver may use the locator to read the associated data stream. Thus, the locator is identified at block 708 and a tuner is instructed to read the data stream associated with the locator at block 710. For instance, the tuner may be a tuner that is tuned to the data stream or it may simply be a tuner that is currently unused. When it is determined at block 706 that the IP address does not correspond to a data stream locator, the local address

corresponds to a network card as shown at block 712 and the network card is instructed to read data from the network at block 714. When the IP address is no longer being used to read the data stream, the IP address may be released for future use. For instance, the interface map may be instructed to release the IP address for
5 future use when it is no longer in use.

Although the IP address has been specified, there may be multiple multicast addresses associated with the IP address. Thus, once the tuner or network card has been instructed to read the data identified by the IP address, a multicast group address associated with the IP address is specified as described above with reference to block
10 308. Packets addressed to the multicast address may then be received as shown at block 310.

Through the use of the present invention, an IP address may be used to specify a network card or a data stream associated with a tuner. In this manner each data stream may be uniquely identified, even where multiple data streams are associated
15 with a single multicast address. Moreover, through the mapping of an IP address to each data stream, an existing system which is capable of reading data associated with a network card may easily be modified for use with a tuner.

The present invention may be implemented on any suitable computer system. FIG. 8 illustrates a typical, general-purpose computer system 1502 suitable for
20 implementing the present invention. The computer system may take any suitable form. For example, the computer system may be integrated with a digital television receiver or set top box.

Computer system 1530 or, more specifically, CPUs 1532, may be arranged to support a virtual machine, as will be appreciated by those skilled in the art. The
25 computer system 1502 includes any number of processors 1504 (also referred to as

central processing units, or CPUs) that may be coupled to memory devices including primary storage device 1506 (typically a read only memory, or ROM) and primary storage device 1508 (typically a random access memory, or RAM). As is well known in the art, ROM acts to transfer data and instructions uni-directionally to the CPUs 1504, while RAM is used typically to transfer data and instructions in a bi-directional manner. Both the primary storage devices 1506, 1508 may include any suitable computer-readable media. The CPUs 1504 may generally include any number of processors.

A secondary storage medium 1510, which is typically a mass memory device, may also be coupled bi-directionally to CPUs 1504 and provides additional data storage capacity. The mass memory device 1510 is a computer-readable medium that may be used to store programs including computer code, data, and the like. Typically, the mass memory device 1510 is a storage medium such as a hard disk which is generally slower than primary storage devices 1506, 1508.

The CPUs 1504 may also be coupled to one or more input/output devices 1512 that may include, but are not limited to, devices such as video monitors, track balls, mice, keyboards, microphones, touch-sensitive displays, transducer card readers, magnetic or paper tape readers, tablets, styluses, voice or handwriting recognizers, or other well-known input devices such as, of course, other computers. Finally, the CPUs 1504 optionally may be coupled to a computer or telecommunications network, *e.g.*, an internet network or an intranet network, using a network connection as shown generally at 1514. With such a network connection, it is contemplated that the CPUs 1504 might receive information from the network, or might output information to the network in the course of performing the above-described method steps. Such information, which is often represented as a sequence

of instructions to be executed using the CPUs 1504, may be received from and outputted to the network, for example, in the form of a computer data signal embodied in a carrier wave.

Although illustrative embodiments and applications of this invention are shown and described herein, many variations and modifications are possible which remain within the concept, scope, and spirit of the invention, and these variations would become clear to those of ordinary skill in the art after perusal of this application. For instance, the present invention is described as being implemented within the context of a digital television receiver. However, the present invention may be used in other contexts. Moreover, although the present invention is described as being implemented on a JAVA PLATFORM, it may also be implemented on a variety of platforms. Moreover, the above described process blocks are illustrative only. Therefore, the present invention may be performed using alternate process blocks as well as alternate data structures. Accordingly, the present embodiments are to be considered as illustrative and not restrictive, and the invention is not to be limited to the details given herein, but may be modified within the scope and equivalents of the appended claims.

Claims

What is claimed is:

- 5 1. A method of identifying a data stream in a digital television receiver,
comprising:
obtaining a locator adapted for identifying a data stream;
associating the locator with one of a plurality of data streams, each one of the
plurality of data streams being associated with one of a plurality of television
10 channels; and
mapping the locator to an IP address.
2. The method as recited in claim 1, further comprising:
generating the IP address from a set of IP addresses reserved for use in private
15 networks.
3. The method as recited in claim 1, wherein creating a locator comprises:
instantiating a locator object.
- 20 4. The method as recited in claim 3, further comprising:
garbage collecting the locator object when it is no longer used.
5. The method as recited in claim 1, wherein each one of the plurality of data
streams is associated with the same one of the plurality of television channels.
- 25 6. The method as recited in claim 3, wherein the plurality of data streams are
associated with two or more of the plurality of television channels.
7. The method as recited in claim 1, wherein each one of the plurality of data
30 streams is associated with a single tuner.
8. The method as recited in claim 1, wherein the plurality of data streams are
associated with two or more tuners.

9. The method as recited in claim 1, further comprising:
allocating a private IP address to be mapped to the locator.
- 5 10. A method of selecting a data stream in a digital television receiver,
comprising:
obtaining a data stream locator associated with a data stream;
providing the data stream locator to an interface map, the interface map being
adapted for mapping one or more data stream locators to one or more IP addresses;
10 and
receiving an IP address associated with the data stream locator from the
interface map.
11. A method of selecting a data stream in a digital television receiver,
15 comprising:
obtaining an IP address;
determining whether the IP address corresponds to a data stream locator
associated with a data stream; and
when it is determined that the IP address corresponds to a data stream locator
20 associated with a data stream, selecting the data stream associated with the data
stream locator.
12. The method as recited in claim 11, further comprising:
instructing a tuner to read the data stream associated with the data stream
25 locator.
13. The method as recited in claim 12, wherein instructing a tuner to read the data
stream associated with the data stream locator comprises instructing a tuner that is
tuned to the data stream to read the data stream associated with the data stream
30 locator.
14. The method as recited in claim 12, wherein instructing a tuner to read the data
stream associated with the data stream locator comprises instructing a tuner that is
currently unused to read the data stream associated with the data stream locator.

15. The method as recited in claim 11, further comprising releasing the IP address for future use when the IP address is no longer being used.

5 16. The method as recited in claim 11, wherein determining whether the IP address corresponds to a data stream locator associated with a data stream is performed by an interface map responsible for mapping one or more locator objects to one or more IP addresses, each one of the locator objects being associated with a data stream, the method further comprising:

10 instructing the interface map to release the IP address for future use when the IP address is no longer being used.

17. A method of selecting multicast IP data transmitted in broadcast streams, comprising:

15 instantiating a multicast object capable of listening for multicast data which is sent through the object, the object including a method for specifying an IP address, a method for specifying a multicast group address to listen in on, and a method for receiving packets addressed to the multicast address;

20 calling the method for specifying an IP address, the method instructing a tuner to read a data stream associated with the IP address when the IP address corresponds to a data stream locator, and otherwise instructing a network card to read data from the network;

calling the method for specifying a multicast group address to specify a multicast group address associated with the IP address; and

25 calling the method for receiving packets addressed to the multicast group address.

18. The method as recited in claim 17, further comprising:

garbage collecting the multicast object when it is no longer being used.

30

19. A method of selecting multicast IP data transmitted in broadcast streams, comprising:

obtaining an IP address;

determining whether the IP address corresponds to a data stream locator associated with a data stream;

specifying a multicast group address associated with the IP address;

- when it is determined that the IP address corresponds to a data stream locator
5 associated with a data stream, instructing a tuner to read the data stream associated with the data stream locator and to receive packets addressed to the multicast group address; and

when it is determined that the IP address does not correspond to a data stream locator associated with a data stream, instructing a network card identified by the IP
10 address to listen to the multicast group address.

20. The method as recited in claim 19, further comprising:
receiving packets addressed to the multicast group address.

- 15 21. A method of selecting multicast IP data transmitted in broadcast streams, comprising:

obtaining an IP address, the IP address having an associated data stream locator;

- instructing a tuner to read a data stream associated with the data stream
20 locator;

specifying a multicast group address associated with the data stream; and
receiving packets addressed to the multicast group address.

22. A computer program product for selecting a data stream, the computer
25 program product comprising:

a computer-readable medium storing computer-readable instructions thereon,
the computer-readable instructions including:

instructions for obtaining an IP address;

- instructions determining whether the IP address corresponds to a data stream
30 locator associated with a data stream; and

instructions for selecting the data stream associated with the data stream locator when it is determined that the IP address corresponds to a data stream locator associated with a data stream.

23. A digital television receiver for selecting multicast IP data transmitted in broadcast streams, comprising:

a processor; and

a memory, the memory storing therein instructions for:

5 obtaining an IP address, the IP address having an associated data stream locator;

instructing a tuner to read a data stream associated with the data stream locator;

specifying a multicast group address associated with the data stream;

10 and

receiving packets addressed to the multicast group address

\\HBW_MAINDATA\Patents\S's\SUN6 500-SUNIP50...

Page 1 of 1

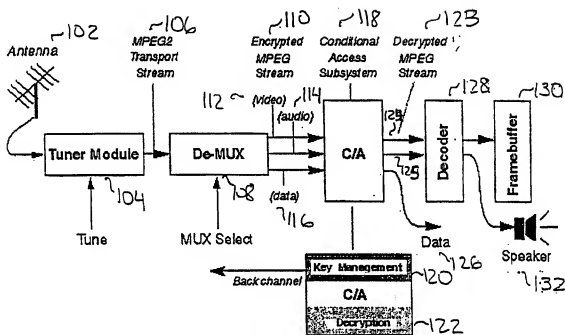


FIG. 1

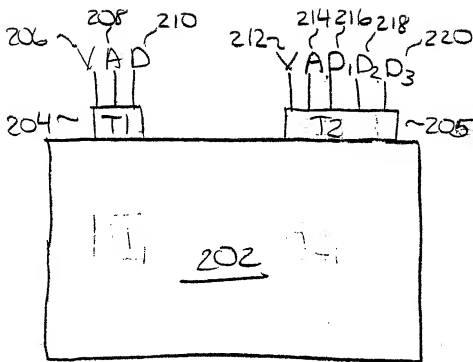


FIG. 2

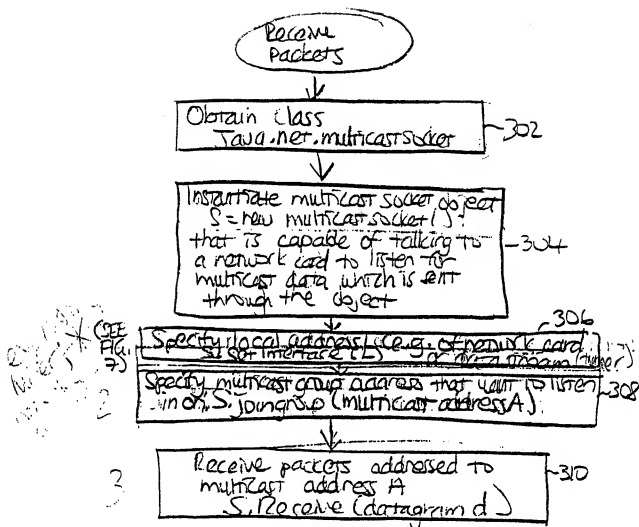


FIG. 3

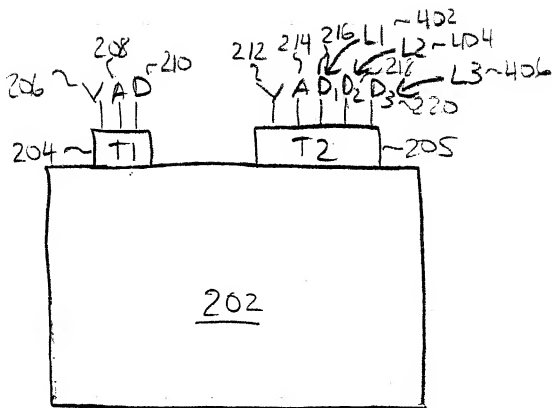


FIG. 4

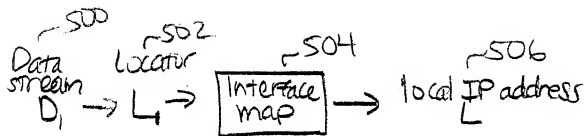


FIG. 5

6/8

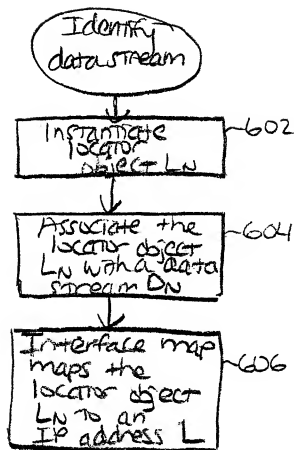


FIG. 6

7/8

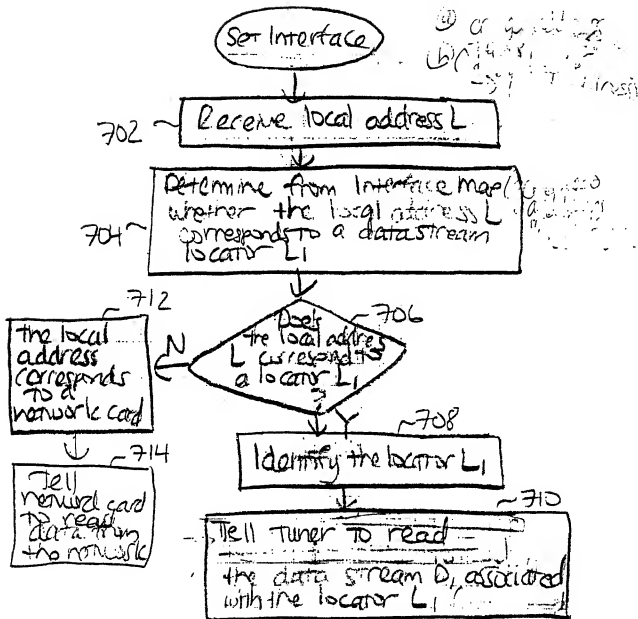
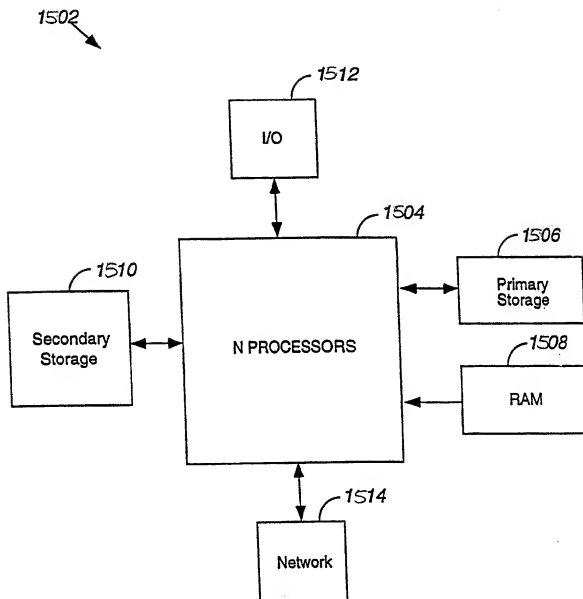


FIG. 7

8/8

*Figure 8*

INTERNATIONAL SEARCH REPORT

Intern: al Application No
PCT/US 00/19394

A. CLASSIFICATION OF SUBJECT MATTER
IPC 7 H04N7/24

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
IPC 7 H04N

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

EPO-internal, INSPEC, WPI Data, PAJ

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X Y A	EP 0 844 766 A (NOKIA TECHNOLOGY GMBH) 27 May 1998 (1998-05-27) abstract page 5, line 4 -page 5, line 39 page 7, line 2 -page 7, line 35 page 7, line 47 -page 7, line 51 page 9, line 3 -page 9, line 15 ---	1,2,5, 7-13 3,4,6, 15,16, 21-23 14,17-20
Y A	WO 97 20413 A (NOKIA OY AB ;HAKULINEN HARRI (FI)) 5 June 1997 (1997-06-05) abstract page 1, line 26 -page 1, line 31 page 4, line 6 -page 6, line 1 page 6, line 31 -page 7, line 28 page 15, line 10 -page 15, line 21 --- -/--	3,4,6, 15,16 1,10,11

☒ Further documents are listed in the continuation of box C.

☒ Patent family members are listed in annex.

* Special categories of cited documents:

- *A* document defining the general state of the art which is not considered to be of particular relevance
- *E* earlier document but published on or after the international filing date
- *L* document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
- *O* document referring to an oral disclosure, use, exhibition or other means
- *P* document published prior to the international filing date but later than the priority date claimed

- *T* later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
- *X* document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
- *Y* document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.
- *S* document member of the same patent family

Date of the actual completion of the international search

6 November 2000

Date of mailing of the international search report

10/11/2000

Name and mailing address of the ISA
European Patent Office, P.B. 5018 Patentlaan 2
NL - 2280 HV Rijswijk
Tel: (+31-70) 340-2040, Tx: 31 651 epo nt,
Fax: (+31-70) 340-3016

Authorized officer

Hampson, F

INTERNATIONAL SEARCH REPORT

Intern: al Application No

PCT/US 00/19394

G.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	BORMANN C ET AL: "IP-MULTICAST UEBER SATELLIT" FUNKSCHAU, DE, FRANZIS-VERLAG K.G. MUNCHEN, vol. 71, no. 21, 2 October 1998 (1998-10-02), pages 55-57, XP000851045 ISSN: 0016-2841	21-23
A	page 55, left-hand column, line 1 -page 56, left-hand column, line 30 ----	17-20
A	CLAUSEN H D ET AL: "MPEG-2 AS A TRANSMISSION SYSTEM FOR INTERNET TRAFFIC" IEEE INTERNATIONAL PERFORMANCE, COMPUTING AND COMMUNICATIONS CONFERENCE, US, NEW YORK, NY: IEEE, February 1998 (1998-02), pages 101-107, XP000668934 ISBN: 0-7803-4469-3 abstract paragraph '3.2.2! -----	1-23

INTERNATIONAL SEARCH REPORT

Information on patent family members

Internal Application No

PCT/US 00/19394

Patent document cited in search report		Publication date	Patent family member(s)		Publication date
EP 0844766	A	27-05-1998	FI	964640 A	28-07-1998
			FI	970186 A	17-07-1998
WO 9720413	A	05-06-1997	FI	955773 A	31-05-1997
			AU	7698296 A	19-06-1997